F I G. 1 PRIOR ART

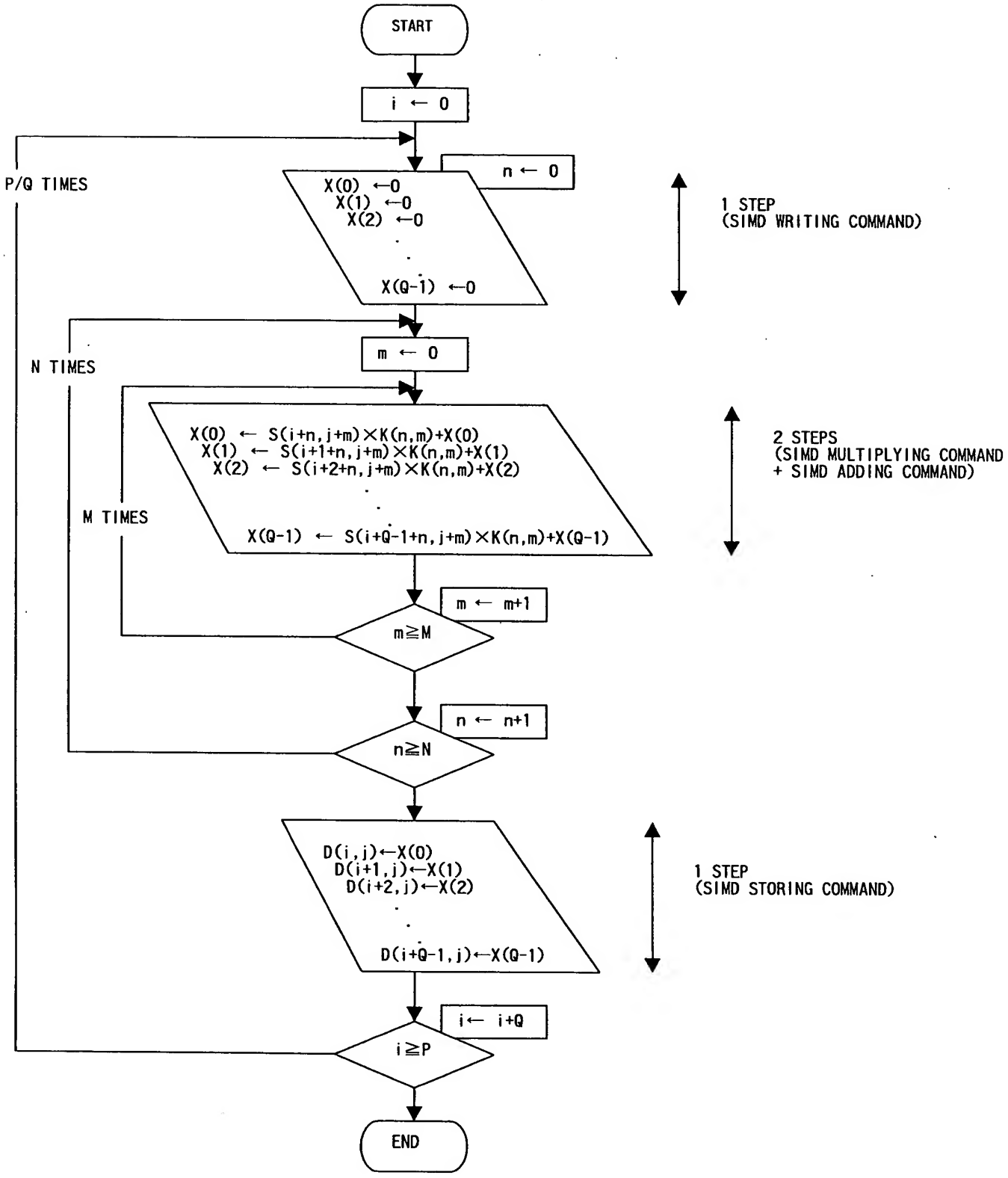
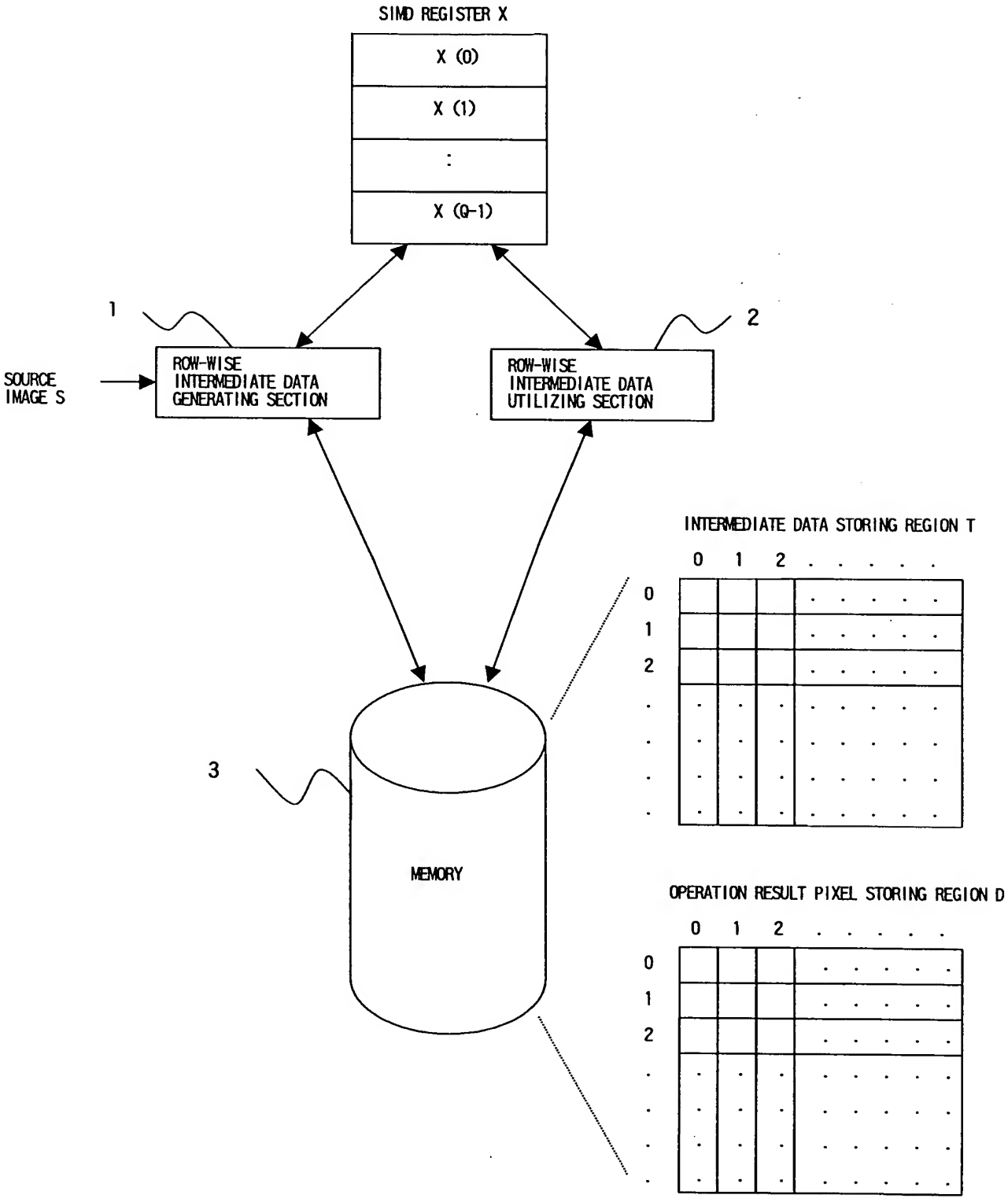


FIG. 2


SIMD REGISTER X
X (0)
X (1)
:
X (Q-1)
1
2
SOURCE IMAGE S
ROW-WISE INTERMEDIATE DATA GENERATING SECTION
ROW-WISE INTERMEDIATE DATA UTILIZING SECTION
3
MEMORY
INTERMEDIATE DATA STORING REGION T
OPERATION RESULT PIXEL STORING REGION D

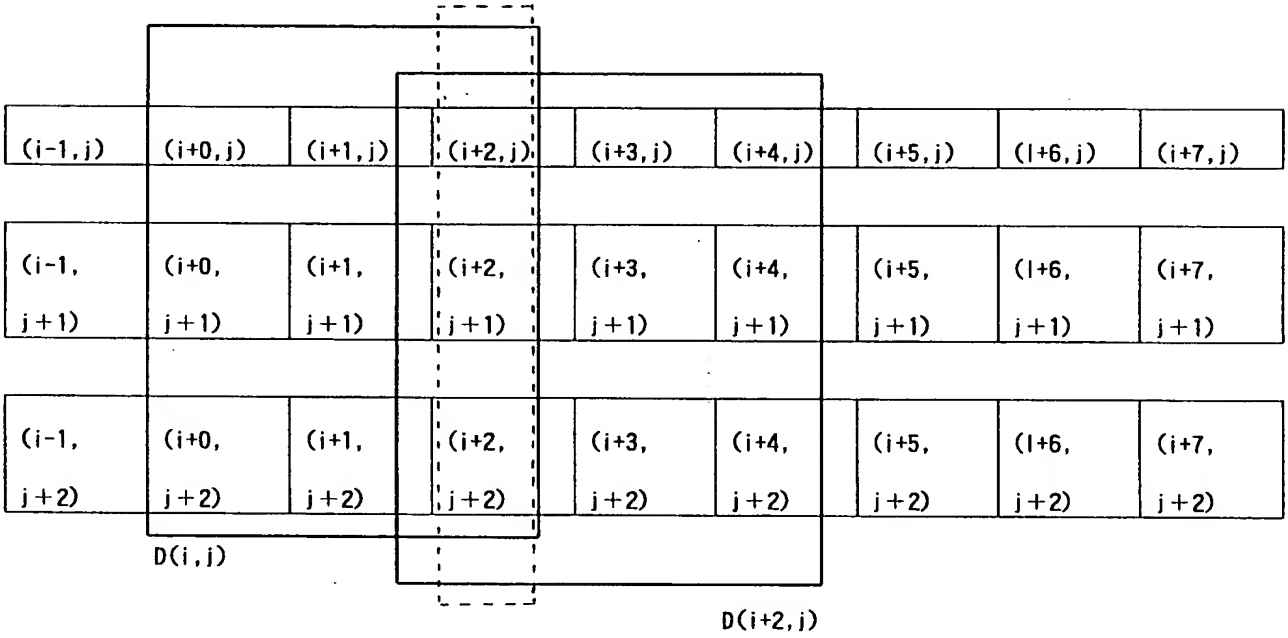
F I G. 3

SYMMETRIC KERNEL COEFFICIENTS

K(0,0)	K(1,0)	K(2,0)
K(0,1)	K(1,1)	K(2,1)
K(0,2)	K(1,2)	K(2,2)

IN THIS,
K(2,0)==K(0,0)
K(2,1)==K(0,1)
K(2,2)==K(0,2)

SOURCE IMAGE S



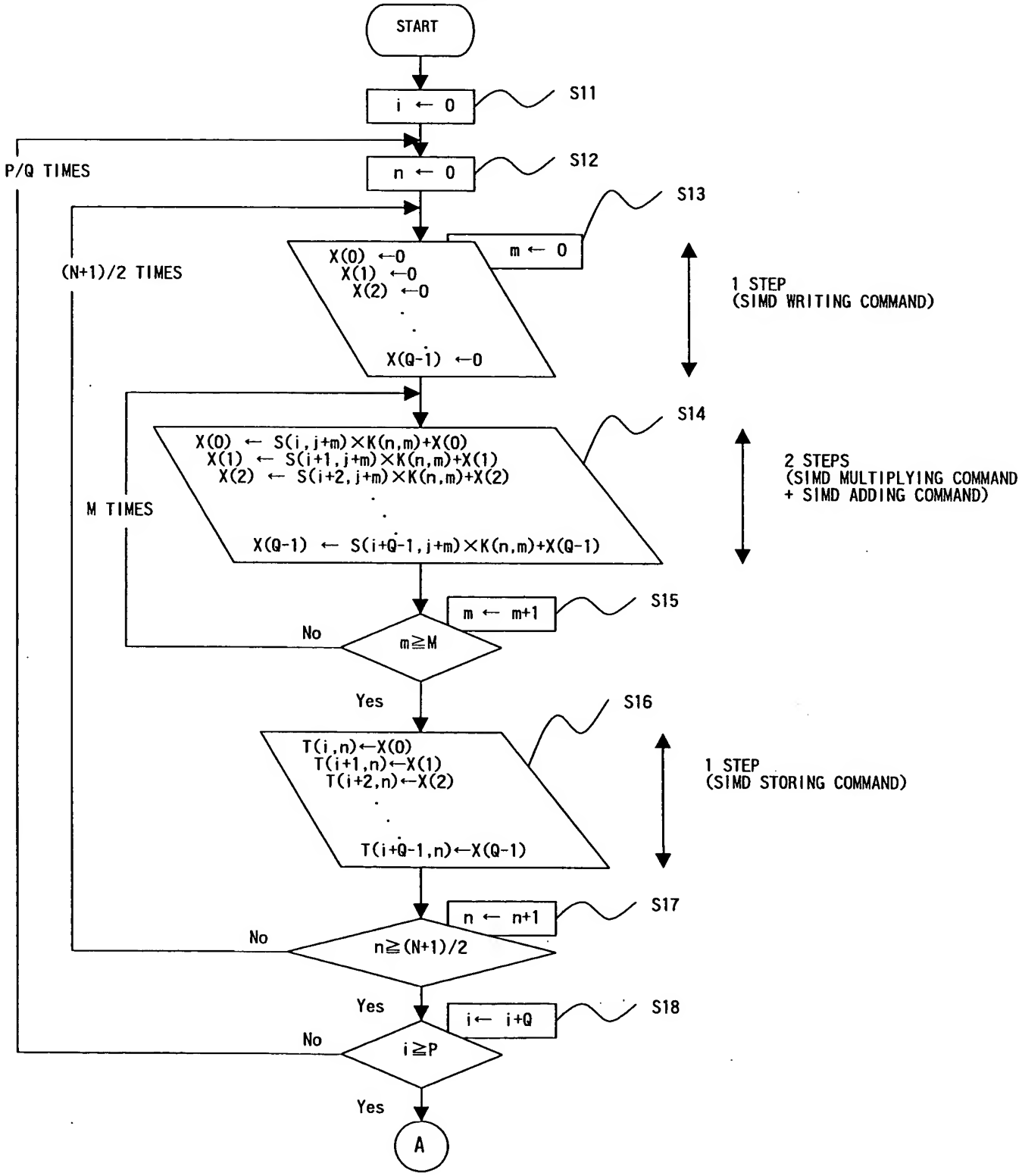
D(i,j), D(i+2,j): TWO OPERATION RESULT PIXELS POSITIONED IN THE SAME ROW

$$D(i,j) = S(i,j+0)\times K(0,0)+S(i+1,j+0)\times K(1,0)+\underline{S(i+2,j+0)\times K(2,0)} + S(i,j+1)\times K(0,1)+S(i+1,j+1)\times K(1,1)+\underline{S(i+2,j+1)\times K(2,1)} + S(i,j+2)\times K(0,2)+S(i+1,j+2)\times K(1,2)+\underline{S(i+2,j+2)\times K(2,2)}$$

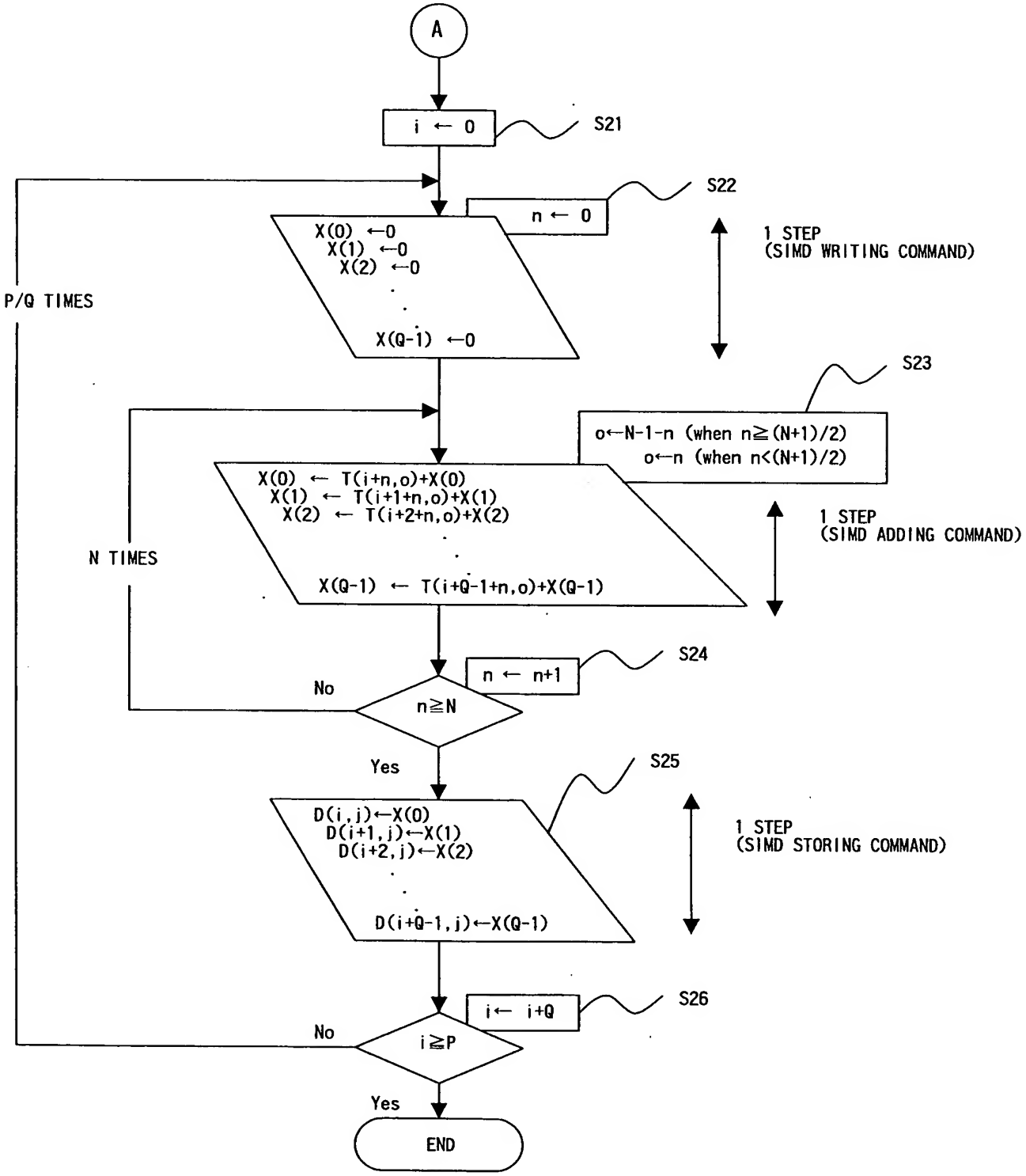
COMMON ITEMS

$$D(i+2,j) = \underline{S(i+2,j+0)\times K(0,0)}+S(i+3,j+0)\times K(1,0)+S(i+4,j+0)\times K(2,0) + \underline{S(i+2,j+1)\times K(0,1)}+S(i+3,j+1)\times K(1,1)+S(i+4,j+1)\times K(2,1) + \underline{S(i+2,j+2)\times K(0,2)}+S(i+3,j+2)\times K(1,2)+S(i+4,j+2)\times K(2,2)$$

FIG. 4A


START
i ← 0
S11
n ← 0
S12
P/Q TIMES
S13
m ← 0
X(0) ←0
X(1) ←0
X(2) ←0
X(Q-1) ←0
(N+1)/2 TIMES
1 STEP
(SIMD WRITING COMMAND)
S14
X(0) ← S(i,j+m)×K(n,m)+X(0)
X(1) ← S(i+1,j+m)×K(n,m)+X(1)
X(2) ← S(i+2,j+m)×K(n,m)+X(2)
X(Q-1) ← S(i+Q-1,j+m)×K(n,m)+X(Q-1)
M TIMES
2 STEPS
(SIMD MULTIPLYING COMMAND
+ SIMD ADDING COMMAND)
S15
m ← m+1
No
m≧M
Yes
S16
T(i,n)←X(0)
T(i+1,n)←X(1)
T(i+2,n)←X(2)
T(i+Q-1,n)←X(Q-1)
1 STEP
(SIMD STORING COMMAND)
S17
n ← n+1
No
n≧(N+1)/2
Yes
S18
i← i+Q
No
i≧P
Yes
A

F I G. 4B


A
i ← 0
S21
n ← 0
S22
X(0) ←0
X(1) ←0
X(2) ←0
X(Q-1) ←0
1 STEP
(SIMD WRITING COMMAND)
P/Q TIMES
S23
o←N-1-n (when n≧(N+1)/2)
o←n (when n<(N+1)/2)
X(0) ← T(i+n,o)+X(0)
X(1) ← T(i+1+n,o)+X(1)
X(2) ← T(i+2+n,o)+X(2)
X(Q-1) ← T(i+Q-1+n,o)+X(Q-1)
1 STEP
(SIMD ADDING COMMAND)
N TIMES
S24
n ← n+1
No
n≧N
Yes
S25
D(i,j)←X(0)
D(i+1,j)←X(1)
D(i+2,j)←X(2)
D(i+Q-1,j)←X(Q-1)
1 STEP
(SIMD STORING COMMAND)
S26
i← i+Q
No
i≧P
Yes
END

F I G. 5

m ↓ \ n →	0	1	2	3	4	5	6	7	8	9	10	11	12
0	0	0	0	0	0	-1	-1	-1	0	0	0	0	0
1	0	0	0	-1	-1	-2	-2	-2	-1	-1	0	0	0
2	0	0	-2	-2	-3	-3	-4	-3	-3	-2	-2	0	0
3	0	-1	-2	-3	-3	-3	-2	-3	-3	-3	-2	-1	0
4	0	-1	-3	-3	-2	+4	+6	+4	-2	-3	-3	-1	0
5	-1	-2	-3	-3	+4	14	19	14	+4	-3	-3	-2	-1
6	-1	-2	-4	-2	+6	19	24	19	+6	-2	-4	-2	-1
7	-1	-2	-3	-3	+4	14	19	14	+4	-3	-3	-2	-1
8	0	-1	-3	-3	-2	+4	+6	+4	-2	-3	-3	-1	0
9	0	-1	-2	-3	-3	-3	-2	-3	-3	-3	-2	-1	0
10	0	0	-2	-2	-3	-3	-4	-3	-3	-2	-2	0	0
11	0	0	0	-1	-1	-2	-2	-2	-1	-1	0	0	0
12	0	0	0	0	0	-1	-1	-1	0	0	0	0	0

F I G. 6

j ↓ \ i →	1	2	3	4	5	6	7	8	9	0	1	2	. . .
	11	12	13	14	15	16	17	18	19	10	11	12	. . .
	21	22	23	24	25	26	27	28	29	20	21	22	. . .
	31	32	33	34	35	36	37	38	39	30	31	32	. . .
	41	42	43	44	45	46	47	48	49	40	41	42	. . .
	51	52	53	54	55	56	57	58	59	50	51	52	. . .
	61	62	63	64	65	66	67	68	69	60	61	62	. . .
	71	72	73	74	75	76	77	78	79	70	71	72	. . .
	81	82	83	84	85	86	87	88	89	80	81	82	. . .
	91	92	93	94	95	96	97	98	99	90	91	92	. . .
	101	102	103	104	105	106	107	108	109	100	101	102	. . .
	111	112	113	114	115	116	117	118	119	110	111	112	. . .
	121	122	123	124	125	126	127	128	129	120	121	122	. . .
	131	132	133	134	135	136	137	138	139	130	131	132	. . .
	141	142	143	144	145	146	147	148	149	140	141	142	. . .
	151	152	153	154	155	156	157	158	159	150	151	152	. . .
	.	.	.	.	.	.	.	.	.	.	.	.	

F I G. 7

THE NUMBER OF N AND M	REDUCED RATE OF OPERATION STEPS (%)
3	16.67
5	30.00
7	35.71
9	38.89
11	40.91
13	42.31
15	43.33
17	44.12
19	44.74
21	45.24
23	45.65
999	49.90